

dissolved oxygen in water is associated with normal activity of most fish (Walburg 1971). Oxygen analyses of good trout streams show dissolved oxygen concentrations that range from 4.5 to 9.5 mg/L (Needham 1969).

pH

Aquatic organisms from a wide range of taxa exist and thrive in aquatic systems with nearly neutral hydrogen ion activity (pH 7). Deviations, either toward a more basic or acidic environment, increase chronic stress levels and eventually decrease species diversity and abundance (**Figure 2.34**). One of the more widely recognized impacts of changes in pH has been attributed to

increased acidity of rainfall in some parts of the United States, especially areas downwind of industrial and urban emissions (Schreiber 1995). Of particular concern are environments that have a reduced capacity to neutralize acid inputs because soils have a limited buffering capacity. Acidic rainfall can be especially harmful to environments such as the Adirondack region of upstate New York, where runoff already tends to be slightly acidic as a result of natural conditions.

Substrate

Stream biota respond to the many abiotic and biotic variables influenced by substrate. For example, differences in

Figure 2.34: Effects of acid rain on some aquatic species. As acidity increases (and pH decreases) in lakes and streams, some species are lost.

